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This experiment was designed to study the value of oral response as opposed to nonoral response in learning by kindergarten children. Approximately 108 kindergarten children were used. About 80 of them were placed in the two experimental groups (that is, the oral and nonoral groups), and the others were placed in a control group. Phase I involved teaching the children to draw simple inferences from information presented to them. Phase II emphasized listening comprehension in answering questions. Phase III, like Phase I, focused upon concept formation and application. The difference in treatment of the oral and nonoral group was that the former said aloud critical words while the latter just listened to the instruction. Only on Phase II tests did the oral group perform significantly better than the nonoral group. The control group performed more poorly than the experimental groups. This study demonstrated the value of instructing children to try to understand and respond to certain linguistic forms involved in the communication of relationships. (WD)

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YOUNG CHILDREN'S USE OF LANGUAGE IN INFERENTIAL BEHAVIOR[1]

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The following experiment was designed to study the value of the oral response during a fairly long curriculum sequence. The study, including pre- and posttesting and administration of the lessons, covered a period of approximately 12 weeks. It was carried out under conditions which approached those of a typical classroom. For example, while maintaining fairly replicable conditions, the instruction was carried out with five or six children at a time, groupings which might be found in a typical kindergarten.

Definition of Listening Skills Selected

In this investigation, attention was focused on the importance of the spoken response in helping the child draw inferences after listening to a set of statements. The goal of the instruction was to improve the child's ability in certain listening skills, defined as follows:

(1) When presented with simple class inclusion or probability statements involving a verbal quantifier (i.e., all, some, or none), the child will respond to a question based on the statement by indicating which one of three possible answers is correct.

(2) When given a concept defining rule involving negation, conjunction, disjunction, or joint denial, the child will identify positive instances of the concept by selecting the appropriate picture.

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In addition, the instructional program was designed to teach listening comprehension of certain concepts and principles in a nature study unit on undersea life.

Hypotheses

Three types of criterion measures were adopted for the study: (1) A Program Mastery Test over the content of a nature study unit (Listening Test of Specific Content); (2) Two Concept Application Tests (a Test of Listening Inference using the quantifiers all, some, or none, and a Rule Utilization Test applying conceptual rules); and (3) Two Listening Skill Transfer Tests (Following Directions and Using Information).

The following hypotheses were tested:

(1) Children given instruction in speaking aloud while learning to use orally-presented information will obtain higher scores on the criterion measures than children given the same instruction without being required to speak aloud.

(2) Both of these instructed groups will be superior to a control group given the pre- and posttests but not the training program.

General Organization of the Study

The investigation was organized into three phases, each with its own criteria, in order to test different aspects of the hypotheses. In Phase 1, the first type of listening skill was taught. Children were given experience in drawing simple inferences from orally-presented information involving class inclusion and probability. In Phase 2 the emphases was upon listening comprehension using concepts and principles in a nature study unit. Since the material was directly taught in the program, the criterion was a Program Mastery

Test of Listening Comprehension over the content of the unit. In Phase 3 the instruction again focused upon concept application. Children were taught to listen to a concept-defining rule and then to apply it to a series of positive and negative instances. Posttests were given at the end of each phase to assess the cumulative impact of the program.

Method

Subjects

The 124 subjects were selected at random from 10 kindergarten classes in a mid-city urban public school. Over 95 percent of the children were black. Five of the classes met in the morning and consisted entirely of first semester kindergartners; the five afternoon classes, taught by the same teachers as the morning sessions, contained second semester pupils. Over the three-month period of the study, 16 pupils were lost through attrition, thus complete data were available for a total of 108 children. The age ranged from 59 to 71 months, with a mean of 64 months. The mean mental age, based on the Peabody Picture Vocabulary Test, was 58 months, with a range of 31 to 96 months. There were a total of 53 children attending the first semester and 55 attending the second semester kindergarten classes. The sample consisted of 56 boys and 52 girls. These subjects were assigned at random to each of the three experimental groups: Oral, Non-oral, and Control. Table 1 presents data for sex, kindergarten level, chronological

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and mental age, by treatments. There were no reliable differences among the three groups on any of these variables.

General Instruction and Testing Procedures

All testing and instruction were carried out in a room, somewhat smaller than a regular classroom, in the building adjacent to the kindergarten rooms. The tests were individually administered to each child.

Within each treatment, the instruction was carried out in groups of five children. All the children in a group were escorted to the experimental room by an assistant. While that group was being instructed by the experimenter, the assistant escorted the previous group back to the classroom and returned with the next group of five children. In this way it was possible to schedule eight sessions during the morning and another eight during the afternoon, making 16 small groups with a total of 80 children.

The instructional procedures during the lesson were carried out, in so far as possible, in a replicable fashion. Most of the lessons were given in a modified programmed instruction format. However, whenever manipulanda were used, the procedures were more informal.

For the programmed lessons children were each given booklets with one frame per page. Commentary was usually provided by a tape recorder, with each child listening through his own earphones. In order to reduce distractions from other children, dividers were placed on the tables so that each child could see the research assistant but not the other pupils.

On some occasions, partly to provide variety but partly to offer modes of instruction more relevant to a particular task, children were given manipulanda with which to work. During Phase 1, for example, children worked with checkers, blocks, boxes, etc. On other occasions, one large stimulus was presented to all five chidren. For example, the unit on undersea life used a "porthole" as a frame in which were displayed pictures illustrating the story; children indicated their answer by holding up individual response cards.

Phase 1

The objective of Phase 1 was to teach the child to respond appropriately when he heard the verbal quantifiers: all, some, and none, as well as the corresponding terms always, sometimes, and never. After the children listened to a single statement which included one of these quantifiers, they were required to demonstrate understanding by answering questions involving simple inferences based on the statement. The child's answer to such questions was one of three responses: yes, no, or can't tell. A major objective for this unit was to teach the child to withhold judgment.

Pretest

A pretest of 18 items was administered individually to each child in both experimental and control groups. Following a sample item, the child was given a six-item test of negation; i.e., he was required to identify three of six pictures which were not examples of the stated concept. E.g., "Mark all the pictures which do not show something good to eat." Another series of items assessed the child's ability to interpret a conditional statement. E.g., "If Mary sees a cat she is happy. Mary sees a cat. Is she happy?" The next six items dealt with verbal quantifiers. E.g., "All the clowns with striped suits have big noses. This clown has a striped suit. Does he have a big nose?"

On the negation subtest, children obtained an average score of 75 percent where 50 percent represents a chance score. On the test dealing with verbal quantifiers, the average score was at a chance level. (See Table 2.)

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Criterion Test

The major criterion for Phase 1 of the experiment was a test designed to measure the child's ability to draw inferences, given statements involving the words all, some, or none. These terms were extended to include corresponding statements with the words always, sometimes, or never. In the Listening Inference Test there are 17 items which vary from simple picture identification to statements requiring drawing inferences with three dimensional materials. It was administered on an individual basis to each child in the experimental and control groups.

Two features of this test should be noted: (1) It was designed as an individual test. While this meant that fewer items could be included in the test, with concomitant loss in reliability, the fact that the test was an individual one increases the likelihood that all children, especially those in the control group, would perform at an optimal level. On group tests, children without experience in testing often receive low scores simply because the group instructions are difficult to follow. Thus the child may do poorly not because he lacks knowledge or ability but because he fails to understand the task. (2) The test is essentially a transfer test for the experimental groups. For example the items dealing with classes used cards which presented the same problems within a different context. To assess understanding of sometimes children were presented with spinners which were quite different from any instructional item encountered in the program.

The Instructional Program for Phase 1

The instructional program for Phase 1 covered a period of approximately six weeks, divided into Phase 1A and Phase 1B. During Phase 1A, which involved two and one-half weeks, both experimental groups were taught to withhold judgment, i.e., to say, "Can't tell," when presented with insufficient information.

The children were given a variety of problems where the correct answer was "Yes" or "No" or, where insufficient information was presented, "Can't tell." All children responded in two ways: either by marking appropriate pictures or by saying aloud one of the three possible responses.

In Phase 1B, Oral and Non-oral treatment differences were introduced. Children in the Oral group were told to speak the key word or sentence for each item just before they made their selection of the picture. Children in the Non-oral group made the selection without speaking.

During the few sessions where programmed booklets were not used, the same distinction in the instructions was maintained. Members of the Oral group spoke out many times during each lesson, using the critical words as cues for answering the questions. In general, the children in the Non-oral group remained silent, although occasionally there was some spontaneous and unsolicited oral responding.

Children in both experimental groups were taught to deal with simple statements involving verbal quantifiers. The first items involved inferences of the following types:

All A's are B. Here is an A. Is it a B? (Answer: "Yes")
Some A's are B. Here is an A. Is it a B? (Answer: "Can't tell")
No A's are B. Here is an A. Is it a B? (Answer: "No")

The general sequence of the instruction was first to teach the child to describe situations by using the quantifiers appropriately. For example, the children described different bowls of fish by using the appropriate sentence: "All of the fish have stripes," "Some of the fish have stripes," or "None of the fish have stripes."

Children in the Oral group repeated the sentence before selecting the the bowl described; the children in the Non-oral group heard the sentence and selected the appropriate picture.

The same type of task was taught with manipulanda. Chidren were shown a box in which there were only red checkers. The experimenter selected a checker from the box, without letting the children see what was removed, and asked "Do I have a red checker?" Children were reinforced for saying "Yes." Similarly, when the box contained only black checkers, children were reinforced for saying "No" when asked, "Do I have a red checker?" On other occasions, the box contained some black and some red checkers. Now when a checker was removed and the child was asked, "Do I have a red checker?," the correct answer was "Can't tell." To teach the behavior of withholding judgment, the problem was introduced with the question, "Can you tell for sure?"

Several games were included to supplement the programmed books. While these informal activities were not completely replicable, they produced a high level of motivation and participation.

Picture Box Game

To help in teaching an understanding of the probability terms, the "Picture Box Game" was introduced. Here the child was shown two boxes, one called the "cue" box and the other the "consequence" box. The front of the "cue" box had three back-lighted glass panels, each 8" x 10" in size, in front of which three pictures were displayed. The light behind each picture was controlled by the switch below that picture. The "consequence" box was one-third as large since it contained only one glass panel. The picture in this box was illuminated only when the button under the appropriate cue picture was pressed. Whether or not pressing the button for any of the three cue pictures would produce a light in the consequence picture was determined by the setting on the switch controlling that picture. The setting for any or all of these cue pictures could be such that the consequence picture would light up every time, some of the time (on a random schedule), or never.

The game proceeded as follows: Four pictures were first inserted behind the glass panels. For example, the three cue pictures might be an elephant, a dog, and a horse, while the consequence picture might be a clown. The children were told, "One of these animals always makes the clown laugh; one of them sometimes makes the clown laugh, and one of them never makes the clown laugh. Let's find which animal always makes the clown laugh."

Children would take turns pressing buttons and making predictions as to which animal would always, which one would sometimes, and which one would never make the clown laugh. The group always knew which button had been pressed because the light would go on in the cue picture. If a child selected the picture of the animal which always made the clown laugh, the clown lighted up every time. If he selected the one which never made the clown laugh the clown would not be lighted and an aversive buzzer sound was produced instead. For the third picture, sometimes the clown lighted and sometimes it did not. In the latter case, the aversive buzzer sounded. The game was played until every child had learned to turn on the appropriate light for any one of the three types of statements.

Since the pictures could easily be replaced, other kinds of Picture Box games could be played with the control switch at the rear reset so that the child would not learn a position cue for all the games.

The advantage of this type of game was that the child learned to distinguish between always and sometimes, and sometimes and never. Where some doubt existed, a child could press one button repeatedly and find the correct relationship between that cue picture and the consequence, e.g., that the cue picture was indeed sometimes followed by the consequence and other times not. Getting repeated confirmations made the discrimination learning easier.

Path Game

A paper version of the Picture Box game just described provided the children with a map showing a number of colored paths leading away from a starting point. In this Path Game, all of the paths marked by one color led to a specified goal, none of the paths of another color ended up at this goal, while only some of the paths of a third color reached the goal. By actually tracing the paths with their pencils the children could find out, respectively, which of the three colors "always," "sometimes," and "never" led to the goal. After the children had empirically determined these relationships, they were asked questions for which the appropriate response could be "Yes," "No," or "Can't tell." Compared to the Picture Box Game, in which one child responded while the other children watched, the Path Game provided the opportunity for all children to respond to each item.

Results for Phase 1

Table 3 presents by treatments the means and standard deviations on the

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criterion test, as well as the three subtests. The results of the analysis of covariance for subtests and total test are given in Table 4.

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On the first subtest, (items 1 through 8) in which the child simply responded "Yes," "No," or "Can't tell," to questions based on information given, the Oral and Non-oral groups did fairly well; the means were 6.8 and 7.0,

respectively, only a point less than the maximum. The Control group mean of 5.8, was significantly lower than that of the experimental groups.

The second subtest (the three items in question 9) consisted of a problem similar to one which had been included in the program. Given oral and visual information about the colors on the sides of a cube on which all sides were blue, the children were asked to predict what color would appear on the top if it were thrown. They were also asked to make predictions for cubes which had some sides blue, or none of the sides blue. Since this type of item appeared in the instructional program, it is not surprising that the two experimental groups were significantly superior to the Control. However, the Oral and Non-oral groups did not differ significantly from each other.

In the third and fourth subtests (items 10 and 11) the problems were entirely new to the instructed groups and hence could be considered transfer items. As preliminary training for item 10, children were first shown a spinner, consisting of a cardboard pointer mounted in the center of a four-inch circle. The three segments of the circle were painted green, orange, and purple, respectively, and the child was shown how, by spinning the pointer, one could get different colors. Following this orientation, the child was shown three similar spinners, one with an entirely red circle, one with a circle half red and half yellow, and one with an entirely yellow circle. The child was asked on which spinner the pointer would sometimes get red, on which one it would always get red, and on which one it would never get red. On this item, both instructed groups received a mean of 2.6 which was significantly superior to the control mean of 1.6.

Item 11 tested the child's understanding of the verbal quantifiers, "all," "some," or "none." The child was shown a set of cards on each of which there

was a picture of either a clown or some other object. After all the pictures were displayed, the cards were turned over so the child could see that the backs of some of these cards were pink, some green, and some orange. He was told, "All the pink cards have clowns on them. Does this pink card have a clown on the other side?" Then he was told, "None of the green cards have clowns on them. Does this green card have a clown on the other side?" "Some of the orange cards have clowns on them. Does this orange card have a clown on the other side?" On this posttest problem the instructed groups achieved scores of 1.9 and 1.8, while the control group received 1.3. The difference between instructed and control groups was significant at the .01 level.

Although the problems were designed with a high level of difficulty so as to permit differences between the two experimental groups to emerge, the Oral group did not score reliably higher than the Non-oral on any of the subtests nor on the total test. While the two experimental groups did not approach the maximum score on this difficult test, they were clearly superior to the uninstructed control.

Phase 2

The Teaching of Specific Concepts in Nature Study

The major function for Phase 2 was to test the hypothesis regarding the value of oral responding in learning highly specific subject matter content. The concepts taught were related to undersea animals and included specific information which would help both to identify the animal from among three alternatives and to answer simple "yes-no" questions about it. Since for each Phase the children remained in the same treatment group, the results of this part of the study reflect a cumulative build-up of the effect of the

oral response. The Control group was not given this instruction and could not be expected to answer specific questions over the program content. Therefore, the Control group was not given any of the tests for Phase 2.

Hypothesis

The specific hypothesis of this part of the study was that the children in the Oral responding group who say aloud the concept labels in a nature study program, in comparison with those who respond only "Yes" or "No," will perform better on an identification test consisting solely of selection items, and where oral responses are not required.

Experimental Plan

The total time for Phase 2 was approximately two and one-half weeks. All children in the Oral and Non-oral groups, approximately 80 in number, were given an individual pretest followed by slightly more than a week of instruction, and then an individual posttest.

Instructional Program

This program was concerned with five undersea animals: the octopus, seahorse, crab, scallop, and coral. The children learned where these animals lived, what they ate, how they moved about, and how they protected themselves. The instructional material was presented in several formats, including booklets in which children followed a sequence of frames as they listened to tape-recorded commentary, and dramatic presentations in which pictures were presented through a simulated porthole; children answered questions by marking in booklets or holding up stick-cards containing pictures of the different animals or parts of animals included in the lesson.

Results for Phase 2

In Table 5 are presented the means and standard deviations for the pre-

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and posttests for the Oral and Non-oral groups. It will be noted that on each part of the posttest, as well as on the total, the Oral group obtained higher mean scores than the Non-oral. While these differences are not significant for the first part of the posttest (see Table 6 for Analysis of Covariance) on the second part and on the total posttest the Oral group is

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reliably superior to the Non-oral group. Parenthetically, it may be noted that the main effects of mental age are significant only for the first part of the posttest. These findings indicate that, with this population, acquisition of specific content was facilitated by oral responding.

Phase 3

The final two weeks of the study included a program designed to teach children to listen to and apply conceptual rules. From another point of view, the children were taught to respond appropriately to three little but important words: and, or, and not. Criterion tests were given to the control as well as to both instructed groups. In addition, a general test of transfer for listening comprehension was given to the Oral and Non-oral groups.

The Task

The task used in this study involved deductive learning. Children were given a rule in the form of a simple one or two sentence story, and then expected to apply it on three or four successive items. The task was phrased in terms of finding the missing item which met certain specifications, according to one of four conceptual rules: conjunction, disjunction, joint denial, and exclusion (x and not y). The latter rule was substituted for that of negation in this study because these children had had a good deal of prior instruction with negation in Phase 1.

Children were shown a set of three or four frames, each of which presented three picture choices. Of these three, one was a positive instance and the other two were negative instances of the concept. In order to maintain interest, on the last item of the set the experimenter told the child that he had found the missing object for that problem.

Criterion Tests

Three tests were administered at the conclusion of Phase 3. The first, the Rule Application Test, specifically designed to assess the effectiveness of the instruction, consisted of five problems, each requiring the application of a rule to a series of instances. The first problem contained three items and the others four items apiece. As indicated earlier, each problem was couched in a story framework involving the search for a missing person or object whose description, constituting the rule, was explicitly given to the child. Each of the four conceptual rules was used for at least one problem; the conceptual rule of exclusion was used for two problems. The score for the test was simply the number of items which the child was able to answer correctly out of a maximum possible score of 19. In addition to the total score for all five problems, the data for each of the problems were analyzed separately.

The second and third measures, also administered at the conclusion of Phase 3, were designed to compare the cumulative effect, over all phases of the study, of the Oral treatment versus the Non-oral treatment in fostering broad listening skills. The first of these measured the ability to process information. For each item, the appropriate response to the final question was "Yes," "No," or "Can't tell." After the three orientation items, the child was given a statement of the problem, e.g., "I'm going to tell you about Johnny. Listen and see if Johnny has a baby sister." On some of the problems, the sentences which followed provided the answer to the question posed; on other problems the relevant information was never supplied. The child was then asked to give the answer to the problem, "Does Johnny have a baby sister?" The total possible score for this test was 13 points.

The third test assessed ability to follow directions by marking a set of pictures according to specific instructions, e.g., "If it is not food, draw a line through it." The first item contained six pictures; the remaining four items had 18 pictures apiece. On this test, the total score possible was 60 points.

Results for Phase 3

The results of the Rule Application Test for each of the three treatment groups are presented in Table 7. Here it may be noted that while the differences

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between the Oral and Non-oral groups are fairly small, both these instructed groups performed somewhat better than the Control on every problem. The significance of the differences for problems and total test were obtained by

2 x 3 analyses of variance, using two levels of mental age and three treatment groups (see Table 8). As the data indicate, the differences among the three

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groups were reliable not only on the total score, but for each problem, with the exception of problem 5. The main effect for mental age was significant for the Total Test, as well as for each of the five problems, but no interactions were found to be significant.

Using the Neuman-Keuls Test for differences between the individual pairs of means, both of the experimental groups were found to be significantly superior to the Control on the Total Test. The Oral group was significantly superior to the Control on Problems 1, 2, 3, and 4, while the Non-oral group was superior on Problems 1, 2, and 4. The only significant difference between the Oral and Non-oral groups was for Problem 2, where the Oral group was significantly superior.

The listening tests produced unanticipated results with reference to the major hypothesis. The Non-oral group, contrary to expectations, showed higher mean scores on both these tests than the Oral group. The results given in Table 9 show that the Non-oral group scored several points above the Oral on

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each of these broad transfer measures. (As indicated earlier, the Control was not given this test.) To test the significance of these differences, a 2 x 2 analysis of variance, two treatments with two mental age levels, was carried

out. The results of these analyses presented in Table 10 show that the

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Non-oral group was reliably superior on the first listening test, Using Information. On the second test, Following Directions, although still favoring the Non-oral group, the differences were not reliable. This is the only instance in the present series of studies in which a Non-oral group was superior to the Oral.

Discussion and Conclusions

Summarizing the results of the three phases of this experiment, some conclusions with respect to the major hypotheses may be formulated.

I. Oral versus Non-oral Instruction

The effect of instructing young children to say aloud critical words instead of only listening and responding to multiple choice questions is clearly evident with the specific content of the nature study unit. The Oral group was significantly superior to the Non-oral on the test of concepts and principles covering the life of undersea animals. This was true even when the criterion test required only identification responses, without verbalization.

While differences between the Oral and Non-oral groups were generally unreliable when the task involved the use of quantifiers, negation, or sentential connectives, out of about a dozen comparisons the Oral group was consistently superior. In only one case, however, was this superiority statistically reliable. Thus the major hypothesis could be neither supported nor rejected.

On the more general listening tests, where the task involved skills quite different from those developed in the program, the results were unexpected: the means of the Non-oral group were higher than those of the Oral.

While the superiority of the Non-oral group was not reliable on the Following Directions test, it was clearly significant on the test of Using Information. It would appear that the children in the Oral group may have learned verbalizing habits which interfered with their performance on a listening task different from the one taught during training.

II. Instructed versus Control Groups

When the performance of the two experimental groups is compared with the Control, the value of instruction is supported on almost every comparison. It might be argued that these obtained differences merely indicate that the Control subjects lacked an understanding of the task, rather than an ability to perform. The criterion tests were designed to rule out this possibility. For example, the Listening Inference Test required the child to respond appropriately to the terms always, sometimes and never. After being given an introduction to the way the spinners worked, the child was asked to select, in turn, the spinner which would sometimes, always, or never point to red. These materials were as new to the two instructed groups as to the Control. For the Rule Application Test, the problems were posed in a lifelike form asking the child questions which were not unrelated to the child's everyday life. Children were, for example, asked, "Which of these sweaters could be Jimmy's?" a type of question which they had undoubtedly faced many times. For a large number of the test items, therefore, there seems to be little support for any contention that the Control group was penalized for lack of familiarity with the task.

However, the use of the response alternative, "Can't tell" as a way of expressing the withholding of judgment raises some questions. Did the Control children really understand what was expected of them here? Did they understand, for example, that they were not supposed to guess? This test was preceded by

a rather lengthy instructional program which was intended to teach the youngsters that on this test guessing would not be rewarded. How extensive should such orientation be? If made too extensive it could almost be considered instruction. The orientation attempted to provide a reasonable compromise.

When evaluating the results of an instructional program an important question is: "How much class time is it worth expending for the results obtained?" The total time taken for instructing children in the task of responding to statements involving verbal quantifiers was four or five hours, which does not seem excessive. Where more time is available other tasks could be added to enhance the effectiveness of this instruction. For example, the approach adopted in the present study was one which taught children to withhold judgment. An alternative procedure would ask the child to respond "Maybe" to indicate whether or not a particular outcome is possible.

In any event, this study has demonstrated the potential value of instructing children to understand, i.e., to respond appropriately to, certain linguistic forms involved in the communication of relationships.

TABLE 1

Description of the Three Experimental Groups

Treatment Groups	N	Sex B	Sex G	Kindergarten Level 1	Kindergarten Level 2		CA in Months	MA in Months (PPVT)
Oral	38	19	19	19	19	Mean	64.3	55.1
						S.D.	3.6	13.5
Non-oral	36	20	16	17	19	Mean	64.7	60.2
						S.D.	3.8	14.1
Control	34	17	17	17	17	Mean	64.4	58.5
						S.D.	3.2	14.4

TABLE 2

Means and Standard Deviations of Groups for Three Listening Inference Pretests

Treatment Groups		Negation[a]	Conditional[b]	Class[c]	Total[d]
Oral	Mean	29.2	1.6	2.1	32.9
	S.D.	7.2	1.0	.9	7.5
Non-oral	Mean	31.3	1.9	2.2	35.4
	S.D.	7.5	1.3	.9	7.7
Control	Mean	30.5	1.6	2.4	34.4
	S.D.	8.2	1.1	1.0	8.3

[a]Total possible score is 40; chance = 20

[b]Total possible score is 3; chance = 1

[c]Total possible score is 3; chance = 1

[d]Total possible score is 46; chance = 22

TABLE 3

Means and Standard Deviations
on Listening Inference Test for Three Groups

Group	Oral N=38		Non-oral N=36		Control N=34	
	M	SD	M	SD	M	SD
Subtest 1[a]	6.8	.8	7.0	.9	5.7	.9
" 2[b]	2.3	.6	2.4	.6	1.4	.7
" 3[b]	2.6	.9	2.6	.7	1.6	1.0
" 4[b]	1.9	.6	1.8	.7	1.3	.7
Total Test[c]	13.7	1.9	13.9	2.0	10.0	1.9

[a]Total possible score is 8 points

[b]Total possible score is 3 points

[c]Total possible score is 17 points

TABLE 4

Analysis of Covariance for Listening Inference Test
for Three Groups with Pretest as Covariate

Source	df	Treatment 2		Mental Age 1		Interaction 2		
		MS	F	MS	F	MS	F	MS
Subtest	1	15.85	22.60**	.89	1.20	2.23	3.20*	.70
"	2	11.40	31.40**	.23	.61	1.00	2.75	.36
"	3	10.72	31.31**	2.43	3.02	.04	.05	.81
"	4	4.06	9.22**	.35	.78	.45	1.03	.44
Total Test		158.47	42.61**	2.03	.54	4.06	1.09	3.75

* $p < .05$
** $p < .01$

TABLE 5

Means and Standard Deviations on
Pre- and Posttest for Nature Study Unit

Group	Oral N=37		Non-oral N=34	
	M	SD	M	SD
Pretest	4.8	1.7	5.2	1.3
Posttest[a]				
Subtest 1	8.7	1.7	8.3	2.0
Subtest 2	2.7	0.6	2.3	1.1
Total	11.5	1.8	10.6	2.6

[a]Total score possible is 16

TABLE 6

Analyses of Covariance for Test on Nature Study Unit:
Two Treatment Groups with Pretest as Covariate

Source	df	Treatment 1		Mental Age 1		Interaction 1		Error 66
		MS	F	MS	F	MS	F	MS
Subtest	1	11.01	3.83	11.77	4.09*	.80	.28	2.87
"	2	4.27	5.89*	.34	.46	.28	.37	.72
Total		31.46	7.76*	13.80	3.40	.00	.00	4.05

* $p < .05$

TABLE 7

Means and Standard Deviations
on Rule Application Test for Three Groups

Group	Oral N=36		Non-oral N=36		Control N=32	
	M	SD	M	SD	M	SD
Item 1 (4 pts)	1.9	1.1	1.6	1.1	1.1	.9
" 2 (3 pts)	3.0	1.3	2.4	1.4	1.8	1.2
" 3 (3 pts)	2.5	1.1	2.2	1.2	1.8	1.0
" 4 (3 pts)	2.3	1.4	2.6	1.2	1.8	1.1
" 5 (3 pts)	2.2	1.1	2.2	1.0	1.8	1.0
Total (17 pts)	12.0	3.9	11.0	4.0	8.3	2.9

TABLE 8

Analyses of Variance
for Rule Application Test for Three Groups

Source of Variance	Treatment (A)		Mental Age (B)		Interaction (A x B)		Error
df	2		1		2		98
Test	MS	F	MS	F	MS	F	MS
Item 1	7.28	7.63**	5.07	5.31*	2.66	2.79	.95
" 2	12.56	7.40**	11.18	6.59*	.52	.31	1.69
" 3	4.95	4.01*	5.23	4.23*	.19	.15	1.23
" 4	5.83	4.11*	10.98	7.74*	4.36	3.07	1.41
" 5	2.22	2.34	9.54	10.05**	.10	.11	.94
Total Test	138.22	12.02**	207.20	18.02**	13.65	1.18	11.49

* $p < .05$
** $p < .01$

TABLE 9

Means and Standard Deviations on Listening Transfer Tests for Two Instructed Groups

Group	Oral N 38		Non-oral N 36	
	M	SD	M	SD
Using Information	4.9	2.7	6.5	2.7
Following Directions	46.3	17.8	49.6	16.6

TABLE 10

Analyses of Variance for Listening Transfer Tests

Source	Treatment		Mental Age		Interaction		Error
df	1		1		1		70
	MS	F	MS	F	MS	F	MS
Using Information	25.29	4.18*	90.87	15.04**	6.60	1.09	6.03
Following Directions	18.87	.07	2550.06	9.58*	151.31	.56	266.15

* $p < .05$
** $p < .01$